Lesson 10 - The Role Of Minerals In Human Nutrition

- 1. Introduction
- 2. The Minerals In The Body
- 3. Organic And Inorganic Minerals
- 4. Mineral Deficiencies
- 5. Obtaining The Minerals We Need
- 6. Questions & Answers
- Article #1: The Minerals Of Life By Dr. Herbert M. Shelton

1. Introduction

1.1 The Study of Minerals Is a Fragmentary View

> *"We have become so accustomed to the practice of dividing foodstuffs into their various nutritive factors—proteins, carbohydrates, fats, minerals, vitamins, etc.— that we often miss the importance of the whole food."* —Dr. Herbert M. Shelton

As we begin our lesson on minerals, it is important to keep Dr. Shelton's observation in mind. Phrases like "iron deficiency" and "calcium-rich foods" are all too common in the study of minerals, and they represent a fragmented view of our diet and nutritional well-being.

A mineral deficiency rarely exists by itself in a vacuum, nor can a single food be recommended exclusively because of a particular mineral content. The study of minerals by themselves necessarily leads to a fragmented view of nutrition, and the student should not be quick to attribute conditions in the body solely to a mineral deficiency, nor should he choose certain foods entirely because of their mineral content.

Instead, it is more important to realize that minerals have an interdependence between many other various elements of food and with the complex actions of the organism itself. Minerals are not isolated food factors, but parts of the nutritional whole.

1.2 What Are Minerals?

The broadest definition of a mineral is that it is something that is "neither vegetable nor animal." It has also been defined as a "solid homogeneous crystalline chemical element or compound" such as iron, copper, carbon, aluminium and so forth. For this lesson, we define a mineral as follows: A naturally occurring inorganic element in the soil which is transformed into an organic compound for use and assimilation by the human body.

Notice that there are two parts to the definition: 1) We are concerned only with those minerals that are directly usable by the human organism and that are vital to the healthy functioning of the body. 2) We make a very important distinction between the inorganic form of the mineral as it occurs in the soil and

the organic form of the mineral as it is used by the human body. This difference between organic and inorganic mineral forms is the crucial point in understanding mineral nutrition, and is discussed at length later in this lesson.

2. The Minerals In The Body

2.1 A List of Major and Trace Minerals

We still do not know all the minerals that are present and utilized within the body. We do, however, recognize twenty-eight minerals that have definite uses in the body, and twelve other minerals whose uses are not fully understood.

The following thirteen minerals are found in appreciable quantities within the body and are listed in the order of their total percentages of the body's composition:

Mineral	**Percentage of total body weight**
Calcium	2.00%
Phosphorus	1.00%
Potassium	0.40%
Sulfur	0.25%
Chlorine	0.25%
Sodium	0.25%
Fluorine	0.20%
Magnesium	0.05%
Iron	0.008%
Manganese	0.003%
Silicon	0.002%

Copper	0.00015%
Iodine	0.00004%

The other following minerals are sometimes referred to as "trace minerals" because of the minute amounts present in the body:

Trace Minerals		
Zinc	Titanium	Argon
Cobalt	Tin	Beryllium
Molybdenum	Silver	Boron
Aluminium	Rubidium	Cerium
Chromium	Nickel	Helium
Lead	Mercury	Lanthanum
Neodymium	Neon	Scandium
Selenium	Strontium	Vanadium

2.2 Traditional Approach to Mineral Nutrition

Of the twenty-eight recognized minerals, recommended dietary allowances have been determined for only six: Calcium, phosphorous, iodine, iron, zinc and magnesium. The rest of the minerals are also important to the functioning of the body, but the exact body needs are too indeterminate to list.

We will discuss all the major minerals and some of the trace minerals as to their uses in the body, the recommended daily allowance (if known), the deficiencies caused by their absence and the Food Sources of these minerals.

This is the traditional approach to studying minerals and is a basis for understanding some of the other facts in this lesson. However, this approach does have some shortcomings, and we should note them.

First, their use in the body: No mineral is used in isolation within the body. All minerals interact with other minerals, vitamins, enzymes and so on. It is overly simplistic to say that "iron builds rich blood" or "calcium makes strong bones." For instance, copper must also be present for the iron to be used in blood-building. Likewise, a certain amount of phosphorus must also be present along with the calcium to build bones. However, it is also a fact that certain minerals are utilized by the body as nutrients for specific organs moreso than other organs. Also, the body uses certain minerals in performing certain body functions. Nonetheless, in studying an individual mineral, keep in mind that it is only a part of a whole complex process.

Next, the effect of a mineral deficiency: A mineral deficiency rarely exists in a vacuum and is seldom the only cause for a condition exhibited by the body. Often, a mineral deficiency occurs even when there is

an abundance of the needed mineral in the diet, but the body cannot digest nor assimilate the mineral. Mineral deficiencies are discussed at length later in this lesson.

The recommended allowance of a mineral: This can be almost meaningless. Mineral requirements depend upon individual constitution, climate, type of work, personality, age, sex, body weight, level of health and hundreds of other factors. There can never be one recommended allowance of a mineral that applies to everyone. All given Recommended Allowances may vary considerably and they should not be considered as "law."

Finally, Food Sources of a mineral: Minerals are abundantly supplied in all foods natural to man's diet (fruit, vegetables, seeds, nuts and sprouts). There are certain mineral-rich foods such as calf liver, clams, milk, etc. that are not suitable for the human organism, and any mineral content they may have is negated by the harmful effects they have on the body. Only suitable foods for man are listed in this lesson as sources of a particular mineral. Note also that the mineral contents of foods are calculated upon a fixed size portion (e.g., 100 grams, 4 ounces, etc.). This type of calculation unfairly favors the concentrated foods such as dried fruits, seaweed, nuts, seeds, etc. When choosing such foods keep in mind that ounce for ounce, a person normally eats a larger amount of the less-concentrated foods.

2.3 The Major Minerals in the Body

2.3.1 Calcium

Use in the Body: Calcium is the most abundant mineral in the body. Almost 99% of the body's calcium is in the skeletal structure and the teeth. Calcium is essential for the clotting of blood, the action of certain enzymes and the control of the passage of fluids through the cell walls. It is also essential to normal heart action and muscle contraction.

Effect of deficiency: Calcium deficiency results in retarded bone and tooth development and a fragile skeletal structure. Nervous irritability and muscle sensitivity are, also signs of calcium deficiency. Since calcium is needed for bone and tooth growth, children especially need an adequate calcium intake.

Recommended Allowances: The National Academy of Sciences has made the following recommendations for daily calcium intake:

Men and Women	800 milligrams
Children	800 milligrams
Teenagers	1200 milligrams
Infants	500 milligrams
Pregnant and Nursing Mothers	1200 milligrams

Food Sources: The following foods are high in calcium content:

Sesame seeds	*Oranges*
Green vegetable leaves	*Strawberries*

Almonds	*Papayas*
Figs	*Most nuts*
Sunflower seeds	*Most seeds*
Broccoli	*Most green vegetables*
Apricots	*Most fruits*
Dates	

2.3.2 Phosphorus

Use in the Body: Phosphorus occurs in the protoplasm and nucleus of every cell. It is used in more functions than any other mineral in the body. Phosphorus is necessary to metabolize fats, carbohydrates and proteins. It is used with calcium in the building of bones and teeth. The building of nerve tissue and brain cells requires phosphorus. Like calcium, the largest amount of phosphorus is found in the bones.

Effect of deficiency: A deficiency of phosphorus affects the skeletal structure similarly to a calcium deficiency. A lack of this mineral may also result in mental fatigue and a feeling of depression resulting from exhausted nerve energy.

Recommended Allowances: The following are the official Recommended Allowances for daily phosphorus intake (revised 1974):

Infants	400 milligrams
Children	800 milligrams
Teenagers	1200 milligrams
Adults	800 milligrams
Pregnant and Nursing Mothers	1200 milligrams

Food Sources: All seeds and nuts are excellent sources of phosphorus. In addition, the following foods contain a high percentage of phosphorus:

Coconuts	*Apples*
Peaches	*Pears*
Apricots	*Avocados*

Broccoli	*Green vegetable leaves*
Figs	*Carrots*
Dates	*Mung bean sprouts*
Cabbage	*Beets*
Squash	*Persimmons*

2.3.3 Potassium

Use in the Body: Potassium is a factor in tissue elasticity, healing injuries in the body, liver functioning, normal bowel activity and regular heart rhythm. It is used in regulation of nerve and muscle action and is needed for intercellular fluid balance.

Effect of deficiency: A lack of potassium often results in liver ailments, pimpling of the skin and the slow healing of sores. Weak muscular control and incomplete digestion also accompany a potassium deficiency.

Recommended Allowances: No official recommendations exist for potassium, but unofficial sources estimate the body's daily potassium needs at about 3000 milligrams for adults and 1500 milligrams for children.

Food Sources: Potassium is abundantly supplied in a proper diet, and non-meat eaters should never have a problem in obtaining sufficient potassium. The following foods are especially rich in potassium:

Apricots	*Green vegetable leaves*
Sunflower seeds	*Tomatoes*
Peaches	*Bananas*
Almonds	*Carrots*
Raisins	*Beets*
Dates	*Nectarines*
Figs	*Cabbage*
Avocados	*Lettuce*
Pecans	*Almost all fresh fruits*
Papayas	*Almost all fresh vegetables*

Melons	

2.3.4 Sulfur

Use in the Body: Sulfur is found in the hair, nails, cartilage and blood. It is essential in digestion and elimination, bile secretion, and the purification and toning of the system.

Effect of deficiency: The lack of sulfur may result in inhibition of functioning. It also results in restricted growth, eczema and poor growth of the nails and hair.

Recommendes Allowances: No official recommendations are made for sulfur. Almost all diets contain adequate amounts of this mineral.

Food Sources: The following foods are rich in sulfur:

All cabbage family members	Cucumbers
Lettuce	Pineapples
Avocadoes	Peaches
Tomatoes	Watermelon
Carrots	Strawberries
Apples	Oranges

2.3.5 Chlorine

Use in the Body: Chlorine is required for digestion and elimination. It is needed for normal heart activity and osmotic pressure in the blood and tissues.

Effect of deficiency: A lack of chlorine results in disturbed digestion and in waste retention. Also, a chlorine deficiency may manifest in pyorrhea.

Recommended Allowances: Unofficial estimates place daily chlorine needs at about 500 milligrams.

Food Sources: Sodium chloride (salt) and chlorinated drinking water are not sources of organic chlorine and are poisonous to the body. The following foods are good sources of organic chlorine:

Tomatoes	*Coconuts*
Celery	*Bananas*
Kale	*Pineapples*
Turnips	*Raisins*

Lettuce	*Mangoes*
Avocados	*Strawberries*
Watermelon	

2.3.6 Sodium

Use in the Body: Sodium is utilized in the formation of digestive juices and in the elimination of carbon dioxide. It is needed in the osmotic pressure, maintenance of water balance and proper nerve function. Sodium is also necessary for the utilization of iron.

Effect of deficiency: A sodium deficiency can result in indigestion, arthritis, rheumatism and in gallbladder and kidney stones. Muscle cramps and nausea also accompany a lack of sodium.

Recommended Allowances: Sodium is usually plentiful in most diets. No official recommendations are made, but unofficial estimates of the body's daily sodium needs are about 500 milligrams.

Food Sources: Sodium chloride (table salt) is not a source of organic sodium and is poisonous to the body. The following foods are good sources of organic sodium:

Strawberries	*Sunflower seeds*
Celery	*Broccoli*
Carrots	*Melons*
Raisins	*Cabbage*
Kale	*Lettuce*
Beets	*Peaches*
Sesame seeds	

2.3.7 Flourine

Use in the Body: Flourine is found in the bones, teeth, blood, skin, nails and hair. It is essential to the body's healing processes.

Effect of deficiency: A lack of flourine in the diet can result in tooth decay, weakened eyesight and spinal curvature.

Recommended Allowances: No recommended, allowances exist for flourine.

Food Sources: Flouridated water is not a source of organic flourine; it is injurious to the health. The following foods contain high amounts of organic flourine:

Almonds	Carrots

Vegetable greens	Exists in some quantities in all plants

2.3.8 Magnesium

Use in the Body: Magnesium is found in the blood albumen, bones and teeth. It is employed in carbohydrate metabolism and elimination. Magnesium is necessary for strengthening the nerves and muscles and in conditioning the liver and glands.

Effect of deficiency: A lack of magnesium contributes to nervous conditions and irritability. A poor complexion, heartbeat acceleration, digestive disorders and soft bones may also indicate a magnesium deficiency.

Recommended Allowances: The following reccommendations are made by the National Academy of Sciences:

Infants	60-70 milligrams
Children (1-4 years)	150 milligrams
Children (4-6 years)	200 milligrams
Children (7-10 years)	250 milligrams
Males (11-14 years)	350 milligrams
Males (15-18 years)	400 milligrams
Males (19 older)	350 milligrams
All females	300 milligrams
Pregnant and Nursing Mothers	450 milligrams

Food Sources: The following are good sources of magnesium:

Almonds	Cherries
Dates	Green vegetable leaves
Bananas	Beets
Walnuts	Avocados
Raisins	Pears

Raspberries	Broccoli
Mangoes	Canteloupe

2.3.9 Iron

Use in the Body: Iron is found primarily in the hemoglobin of the body and is closely connected with the quality of blood. About two-thirds of all the body's iron is in the bloodstream, with the remainder distributed in the marrow of the bone, the liver and the spleen. Iron is also used in the building of bones, brain and muscle and in the carrying of oxygen throughout the body.

Effect of deficiency: The most dramatic sign of an iron deficiency is anemia and paleness of complexion. A lack of sufficient iron also results in limited growth and a low vitality level.

Recommended Allowances: The Official recommended daily allowances for iron (revised 1974) are:

Children (1-3 years)	15 milligrams
Children (4-10 years)	10 milligrams
Males (11-18)	18 milligrams
Males, Adult	10 milligrams
Females (11-50 years)	18 milligrams
Females (51 and over)	10 milligrams

Food Sources: The following are good sources of organic iron:

Sesame seeds	*Figs*
Peaches	*Green vegetable leaves*
Apricots	*Lettuce*
Raisins	*Mung bean sprouts*
Walnuts	*Broccoli*
Almonds	*Berries*
Dates	*Cherries*

2.3.10 Manganese

Use in the Body: Manganese is chiefly found in the liver, kidneys, pancreas, lungs, prostrate gland, adrenals, brain and bones. It is used in the metabolism of carbohydrates, and in strengthening tissue and bone. Manganese, like iodine, is used in thyroxine formation in the thyroid. It also seems to be connected with regulation of the blood sugar level.

Effect of deficiency: It should be noted that the National Academy of Sciences has officially stated that no one has observed a manganese deficiency in humans. In laboratory experiments with animals, an induced manganese deficiency produced restricted growth, glandular disorders and defective reproductive functions.

Recommended Allowances: No official recommendations are made for manganese. Unofficial sources place the body's daily manganese needs at about 15-25 milligrams for adults and 2-15 milligrams for children.

Food Sources: Manganese is found in significant quantities in the following foods:

Bananas	Leafy vegetables
Beets	Carrots
Celery	Squash
Cucumbers	Nuts

2.3.11 Silicon

Use in the Body: Silicon is found in the blood, muscles, skin, nerves, nails, hair, connective tissue and teeth. The pancreas is especially rich in silicon. Silicon is also noted for its use in antiseptic action.

Effect of deficiency: Insufficient silicon in the body may result in baldness or the graying of hair. Skin irritations and rashes may develop easily. Hearing and vision may also be affected, and the teeth may decay.

Recommended Allowances: No official daily allowance has been determined for silicon.

Food Sources: Silicon is often concentrated in the skins and outer layers of vegetables and fruits. The following are good sources of silicon:

Lettuce	*Beets*
Strawberries	*Carrots*
Cucumbers	*Tomatoes*
Sunflower seeds	*Cabbage*
Celery	*Watermelon*
Cherries	*Apples*

Apricots	*Bananas*
Figs	*Grapes*
Pears	

2.3.12 Copper

Use in the Body: Copper is found in the liver, gallbladder, lungs and heart. It is essential primarily for the absorption and metabolism of iron.

Effect of deficiency: A deficiency in copper results in the same effects as an iron deficiency, such as retarded hemoglobin production, general debility, limited growth, etc.

Recommended Allowances: No official recommendations are made for copper allowances. Some sources have estimated about 2 milligrams per day. Very few cases of copper depletion have been observed in humans.

Food Sources: All of the following foods contain a significant amount of copper:

Nuts	Sunflower seeds
Raisins	Sesame seeds
Leafy vegetables	

2.3.13 Iodine

Use in the Body: Iodine is found mainly in the thyroid gland. It is essential for the formation of an organic iodine compound called thyroxine which regulates some of the metabolic functions. Iodine is required in the oxidation of fats and proteins and for circulatory functioning.

Effect of deficiency: An iodine deficiency is partially responsible for goiter (the enlargement of the thyroid gland) and cretinism (a subnormal metabolism). A lack of iodine also leads to sensitivity to toxic accumulations, low physical and mental activity and a susceptibility to nervous disorders.

Recommended Allowances: Daily iodine needs are very small. The following are the Daily Dietary Allowances (revised 1974):

Infants (0-5months)	.035 milligrams
Infants (5-12 months)	.045 milligrams
Children (1-3 years)	.060 milligrams
Children (4-6 years)	.080 milligrams
Children (7-10 years)	.110 milligrams

Males (11-14 years)	.130 milligrams
Males (15-18 years)	.150 milligrams
Males (19-22 years)	.140 milligrams
Males (23-50 years)	.130 milligrams
Males (51 over)	.110 milligrams
Females (11-18 years)	.115 milligrams
Females (19-50 years)	.100 milligrams
Pregnant & nursing mothers	.125-.150 milligrams

Food Sources: Iodine is found in high amounts in all sea vegetation. The following are also good sources of iodine:

Swiss chard	Kale
Turnip greens	Strawberries
Squash	Peaches
Mustard greens	Lettuce
Watermelon	Bananas
Cucumbers	Carrots
Spinach	Tomatoes
Pineapples	Grapes

2.3.14 Zinc

Use in the Body: Zinc is found in the brain, genital organs, thyroid, liver and kidneys. It is needed in the healing of wounds and in the transfer of carbon dioxide from the tissue to the lungs. Zinc is also required in the manufacture of insulin and in the regulation of blood sugar.

Effect of deficiency: A lack of zinc may result in mental depression, prostrate troubles and absence of taste. A zinc deficiency may also result in defective intestinal absorption and restricted growth.

Recommended Allowances: The allowances for zinc as recommended by the National Academy of Sciences in 1974 are:

Infants (0-5 months)	3 milligrams
Infants (5-12 months)	5 milligrams
Children (1-10 years)	10 milligrams
Adults	15 milligrams
Pregnant and Nursing Mothers	20-25 milligrams

Food Sources: Zinc is found in the following foods:

All seeds and nuts, especially pumpkin seeds
Sprouted wheat
Most green and yellow vegetables

2.3.15 Other Minerals

The functions and daily allowances of the other minerals in the body have not yet been fully understood. All are important to the health of the human organism, however, and should not be disregarded.

These minerals, often called "trace minerals," will usually be found in sufficient quantities in diets which contain adequate amounts of the major minerals. Like the major minerals, all requirements of the trace minerals are supplied in a varied diet of fruits, vegetables, nuts, seeds and sprouts.

3. Organic And Inorganic Minerals

3.1 The Differences in Mineral Forms

Most knowledgeable people today recognize that the body must have certain minerals to accomplish its work and preserve its health. However, only a few realize that these minerals must be in their organic state to do us any good at all.

Please understand these facts:

1. Minerals are inorganic as they exist naturally in the soil and water.
2. Minerals are organic as they exist in plants and animals.
3. Only plants can transform inorganic minerals into organic minerals.
4. Animals must eat plants or plant-eating animals to obtain their organic minerals.
5. Inorganic minerals are useless and injurious to the animal organism.

3.2 How the Confusion Began

Because inorganic minerals and organic minerals have the same chemical compositions, they were confused by the early nutritionists. The mineral, iron, in the bloodstream has the same chemical composition as the mineral, iron, in a nail—iron is iron, after all. However, these nutritionists incorrectly reasoned that there were no other differences between these two forms of iron. As a consequence, there actually were iron mineral supplements that consisted of surplus powdered nails.

Perhaps you have heard the expression, "mad enough to chew nails." In this case, mad or unbalanced is certainly the correct word.

These nutritionists made an error in reasoning by assuming that a chemical similarity in minerals also meant there was a nutritive similarity between organic and inorganic minerals. While it is true that the same minerals found in the human body are also found in the soil and water it is wrong to assume that the minerals in the soil are food for man. We are not soil eaters—we are plant eaters.

It is necessary that the minerals in the soil be elaborated into organic compounds by the plant before they can be |assimilated by the body. The various mineral compounds produced by the chemist differ in their structure and in the relative positions of their component molecules than those produced in the plant.

Over sixty years ago a German scientist named Abderhalden conducted a series of experiments comparing how several species absorbed different forms of iron. He found that animals fed with food poor in iron, plus in addition of inorganic iron, were unable in the long run to produce as much hemoglobin as those, receiving a natural iron-sufficient diet.

While the inorganic iron may be absorbed into the body, it is not utilized in the formation of hemoglobin, but remains unused within the tissues. Abderhalden also concluded that any apparent benefit of the inorganic iron resulted from its stimulating effect.

Chemically, it is true that iron in the bloodstream and iron in nails are the same and that calcium in rocks (known as dolomite) is identical to calcium in the bones.

However, it is a grave error to believe that the body can digest and assimilate and utilize powdered nails and crushed rocks.

3.3 Mineral Supplements

The idea of administering inorganic minerals as foods and remedies for man started with the German scientist Hensel in the early twentieth century. Later the homeopaths expanded upon his idea and made numerous artificial mineral preparations called cell salts, which are still sold today as popular "cures" for mineral deficiencies. Today mineral supplements exist in many forms and come from many sources. They are all useless.

Mineral supplements are of no benefit to the body because they are: 1) inorganic and 2) fragmented.

Because mineral supplements are inorganic, the body cannot assimilate or use them. In fact, the body must work harder to compensate for the inbalance created by ingesting these supplements. The body accelerates its eliminative activities and works hard to expel these foreign substances. This stimulation is often mistaken for the "beneficial action" of the supplement. Actually, the supplements are not beneficial —they are harmful—and they are inanimate and therefore incapable of acting (except chemically).

As health consumers have grown more aware of the differences between organic and inorganic minerals, so have producers of these supplements. Consequently, there are now mineral supplements which are advertised as coming from "organic" sources. These are equally useless because they exist in a fragmented state, extracted from the sources within which they naturally occur.

Minerals do not work in isolation. When they are extracted from their natural sources, the other co-

existing vitamins, minerals, enzymes, etc., are not also extracted. Even if they were, the process of laboratory extraction destroys any vital benefits that may have been associated with the minerals.

Minerals must be consumed in their natural, unfragmented and organic state to be of any use to the body. The best mineral supplements are those naturally occurring in mineral-rich foods in their unprocessed state—fresh fruits, vegetables, nuts, seeds and sprouts.

3.4 Mineral Waters

Like mineral supplements, mineral waters cannot provide any beneficial minerals to the body. Any minerals contained in such waters are inorganic and must be expelled by the body. Should an excess of these inorganic minerals be consumed in the water, the body cannot rid itself of them fast enough and they are deposited within the body.

These inorganic mineral deposits lead to kidney and gallstone formation, hardening of the arteries, arthritis, heart trouble, ossification of the brain and other serious diseases. The unexpelled mineral matter from mineral-containing waters combines with cholesterol to form plaques. These plaques lead to cardiovascular problems, and they join with uric acid to cause arthritic and rheumatic complaints.

The body cells can use only pure (distilled) water—such as that found in fruits and plants—and they reject all inorganic minerals consumed in mineral-laden waters.

When mineralized waters are drunk, a condition known as leukocytosis occurs within the body in thirty minutes to three hours after drinking. Leukocytosis is the proliferation of white blood cells which are the body's first line of defense against foreign and harmful body substances—in this case, the inorganic minerals in the water.

Mineral waters cannot furnish the body with any needed elements other than the water itself. The remaining inorganic minerals are either eliminated through the skin, kidneys, etc., or they are deposited within the body where they may cause eventual harm.

Sea water is our "richest" mineral water, yet it is poisonous. Similarly, all other mineralized waters are simply dirty waters, contaminated with inorganic matter which is pathogenic to the body.

3.5 How Inorganic Minerals Are Transformed

Even plants, when in their embryonic state, cannot use inorganic minerals in the soil, but instead feed on the organic compounds contained within its seed. Not until its roots and leave? are grown can a plant utilize the inorganic minerals of the soil.

The changing of inorganic matter into organic matter takes place principally in the green leaves of the plant by means of photosynthesis. Only by the presence of chlorophyll is the plant able to utilize the inorganic carbon molecule and convert it with hydrogen and oxygen into the organic combinations of starch and sugar. And, ultimately, the plant combines nitrogen and other mineral elements from the soil into more complex organic combinations. Only the chlorophyll-bearing plants have the ability to assimilate iron, calcium and other minerals from the soil and to use the resulting combinations to construct nucleo-proteins.

Vital changes occur in all minerals as they pass into the structure of plants. These changes cannot be isolated by normal chemical laboratory processes which destroy living plant tissues to analyze them. Such crude methods of studying the role of organic minerals in an organism is somewhat akin to the old medical practice of dissecting cadavers to look for evidence of the human soul.

4. Mineral Deficiencies

So far we have discussed the differences between organic and inorganic minerals and how inorganic minerals cannot be used by the body. Such inorganic mineral forms as supplements and mineral waters are therefore useless in correcting mineral deficiencies. We might now ask what causes a mineral deficiency in the first place.

A mineral deficiency only occurs for two reasons: 1) improper diet and 2) inability of the organism to assimilate and use the mineral.

4.1 Improper Diet as a Cause

An improper diet can be defined as the habitual consumption of foods that are incompatible with our biological heritage, or the eating of usually wholesome foods in a processed state.

For example, we are not biologically adapted to meat-eating because our digestive juices are not strong enough to digest the bones and cartilage of the animal along with its flesh. Consequently, meat-eating humans only get the flesh of the animal and neglect the bones, blood and cartilage—unlike naturally carnivorous animals. It is the bones, blood, cartilage, etc. that contain many of the minerals that are needed by carnivorous animals. Humans who eat only the flesh of animals thus receive a diet very poor in sodium, calcium, sulfur, magnesium and iron.

This is not an argument for eating animals in their whole state—blood, bones, and all—but a serious question of the value of flesh-eating as practiced by humans.

Like meat, grains are also very poor in sodium. Because of these sodium deficiencies, people salt grains and meats to make them more palatable. They add an inorganic chemical, sodium chloride (salt), in an effort to correct the inherent sodium deficiency within these unnatural foods. Of course, the body cannot use sodium in this inorganic form, and it must try to eliminate it. Grains, then, being minerally unbalanced, are not a good food for the human diet.

Foods that are usually regarded as wholesome and mineral-rich can also be rendered minerally unbalanced by processing them. For example, the potato, while not an optimum food, is an acceptable addition to the diet in its whole state. It, too, is somewhat sodium deficient, but its skin is a storehouse of many other minerals. When peeled, boiled or fried, the potato loses much of its mineral content and becomes an unfit food.

A truly mineral-rich diet, then, should consist of food best suited and natural to the human diet which are consumed as they are found in nature with a minimum of processing or preparation.

4.2 Metabolic Deficiencies

Although an improper diet is usually viewed as the main cause of a mineral deficiency, it is also important to realize that a mineral deficiency can occur even when there is an excess of minerals in the diet. Although the minerals may be present, the body, for some reason or other, is unable to digest and assimilate them. In this case, a metabolic deficiency occurs.

For example, in cases of pernicious anemia, which is often viewed as a serious iron deficiency, there is often an excessive amount of iron-containing pigment in all the organs. Post-mortem diagnosis of several anemic patients showed that there was enough iron stored in the spleen to correct the deficiency in the body. The mineral was present, it just was not being metabolized.

Also, in cases with fasting anemic patients, it has been discovered that their number of red blood cells improve and iron is utilized more efficiently while on a fast. It is interesting to note that this occurs

when the patient is not receiving any iron at all in his diet. The fasting condition enables the patients to metabolize the iron already stored within their system.

Similarly, in cases of patients with rickets, a condition often associated with a calcium deficiency, improvements were noted in their conditions after they had fasted for a length of time. They were allowed exposure to sunshine in. sufficient amounts to develop Vitamin D within their bodies. The presence of Vitamin D then allowed them to use the calcium within the body more effectively. These patients were suffering more from a "sunshine deficiency" than from lack of a certain mineral.

Many factors may cause an individual to be unable to assimilate and use the minerals present in his diet. Personal habits, working environment, state of mind, manner of cooking, overworked emotions, lack of sleep, overeating, worry, grief and so on are all causes of impairment of the metabolic process.

To allow the body to assimilate and use the minerals in the diet, the individual may need to correct his habits of living. He may need a physical or mental rest or even a complete physiological rest which can only happen while fasting.

4.3 Minerally Deficient Soils

One last cause of a mineral deficiency should be noted—not because it is a common cause, but because it may be an important consideration for those people who are attempting to grow all their food for self-sufficiency. That cause is: The exclusive consumption of foods which are grown on minerally poor soils.

If the soil itself is minerally deficient, it will be difficult to obtain the minerals we need from the plants grown on that soil. The mineral content of soils in certain locales may be deficient in one or two important minerals. As a result, there can be a wide range of mineral contents in the same variety of food, depending upon the soil in which it was grown. Consider, for example, the variations in these minerals as found in grapes grown in different soils:

Percent ot total Mineral Matter Grapes Grown on different Soils	
Sodium	From 0.29 to 10.54 percent
Calcium	From 1.70 to 22.60 percent
Iron	From 0.05 to 1.68 percent

In this one example you can see how the mineral content of a food can vary up to 35 times, depending upon the soil in which it is grown.

Proper mineral nutrition begins with proper agriculture, and the commercial fertilizing methods of adding chemical nitrogen, potash and phosphoric acid ignore the many other mineral elements required to grow healthy plants.

People who eat fruits, vegetables, nuts and seeds grown n a wide variety of soils rarely have to worry about developing a mineral deficiency because of a single soil deficiency. Those people who do grow and eat all their foods from a single soil source should make compost to insure that their soil contains all the essential minerals needed for good health.

5. Obtaining The Minerals We Need

5.1 All Minerals Present in a Natural Diet

All mineral needs may be supplied to the body by eating a varied diet of fruits, vegetables, nuts, seeds and sprouts as they are found in their natural unprocessed state.

Before these minerals can be efficiently used, it may be necessary to give the body a complete physiological rest through fasting. A fast will enable the body to increase its metabolic powers.

Given that we lead our lives in a healthy manner, free from undue emotional and mental stress, we should have no trouble at all satisfying all our mineral and other nutritive needs from a simple Hygienic diet.

The efficiency of a Hygienic diet in supplying all of our mineral needs can best be illustrated by analyzing the mineral contents of two typical daily menus. These menus were taken at random from Herbert Shelton's book Superior Nutrition, and the reader is referred to this source for more examples of the Hygienic dietary.

The first menu is a summer menu and the second is a fall-winter menu. The amounts of each food below were chosen to be the similar amounts an adult woman or man might eat. For increased mineral or nutritive content, the amounts of food eaten could also be increased in accordance with environment, type of work done, physical constitution, etc. All mineral content estimates were made on the conservative side.

5.2 Examples of Mineral Contents of Meals

SUMMER MENU

Meal	*Food*
Breakfast	Watermelon
Lunch	Bibb lettuce
	Yellow squash
	Sunflower seeds
Dinner	Cherries
	Nectarines
	Bananas

MINERAL CONTENT OF FIVE ESSENTIAL MINERALS

CALCIUM	400 milligrams

IRON	18.2 milligrams
MAGNESIUM	16 milligrams
PHOSPHOROUS	1150 milligrams
IODINE	.245 milligrams

FALL/WINTER MENU

Meal	*Food*
Breakfast	Oranges
	Grapefruit
Lunch	Lettuce
	Asparagus
	Chard
	Almonds
Dinner	Persimmons
	Apples
	Grapes

MINERAL CONTENT OF FIVE ESSENTIAL MINERALS

CALCIUM	600 milligrams
IRON	18.9 milligrams
MAGNESIUM	458 milligrams
PHOSPHOROUS	800 milligrams
IODINE	.235 milligrams

Looking over the mineral contents of these two daily menus, we discover that they usually supply anywhere from 100 to 180 percent of the officially recommended allowances, except for calcium, which

totals 70 - 90% of our daily requirements.

It should be noted that calcium needs on a vegetarian diet (such as this one) are significantly less than the calcium requirements for a carnivorous diet, upon which the official recommendations were based. Consumption of flesh causes the body to excrete calcium to neutralize the toxins within the meat and the uric acid formed. Calcium needs are less on a vegetarian diet.

By adhering to a diet of fresh fruits, vegetables, nuts, seeds and sprouts, a person need never worry about obtaining sufficient minerals in the diet. In fact, this is the most minerally-rich and efficiently utilized diet for humans.

6. Questions & Answers

You said that even mineral supplements from organic sources are fragmented and therefore not wholesome. Isn't there sometimes a need for a megadose of a particular nutrient when there is a severe deficiency?

> First, remember that a deficiency of an individual mineral rarely exists in isolation. If a person, for instance, has a "calcium deficiency," it may be because there is not enough phosphorous in the diet which is used by the body together with calcium, or a Vitamin D deficiency may be responsible for the exhibited calcium deficiency. By supplying a large amount of a specific mineral, you ignore the other accompanying needs of the body.
>
> Finally, along with this idea is the concept of the "law of minimum." This law states that the body is able to use a certain nutrient only to the extent that other necessary nutrients are available. If, for example, you had only enough copper in the body to aid in assimilation of 10 milligrams of iron, taking 30 extra milligrams of iron would do the body no good. Nature provides the minerals and other nutrients we need in a perfectly balanced combination within foods. When we introduce large amounts of minerals, vitamins, etc. in a fragmented form, we throw the body out of balance.

But I've taken dolomite for years and no longer suffer from the signs of calcium deficiency I had before. Why is that?

> When mineral supplements, etc. are added to the diet, it usually is a sign that an individual has become aware of problems within the body. Consequently, along with the taking of supplements, a person often improves his diet, his exercise program or whatever. These changes are what improve a condition, not the supplements.
>
> Supplements and pills of all forms often have a placebo effect upon the individual. That is, you believe you are getting better by taking an external agent—a supplement. Dolomite's chief effect is to cause the formation of stones in the body from the inorganic calcium it contains.

If we get all the calcium we need from fruits, vegetables, nuts, seeds and sprouts, why does the National Dairy Council say we need milk and milk products? Other health organizations say the same thing.

> Milk is such an inappropriate food for humans that some reason has to be given for drinking

it. Since calcium is its most abundant mineral, the National Dairy Council has based its campaign on this fact. First, the calcium in dairy products, and especially in pasteurized products, is not completely assimilable by the body. The calcium in chocolate-flavored milk quickly forms stones of calcium oxalate within the kidneys. Cows' milk cannot even be digested by over 80% of the world's population because they lack the necessary enzyme. Within the milk itself are so many other harmful items (casein—used in glue making, artificial hormones to induce lactation, etc.) that any value obtained from the calcium is completely negated.

Almost the entire health community advocates the use of food supplements, including minerals, because they realize that most people will not eat the strict diet you advocate. How can people who don V eat the most healthful diet still get the minerals they need?

I believe that even people on a typical "junk food" diet can be convinced to eat one or two pieces of fruit a day or a small raw salad or a handful of raisins. There are more usable minerals in a single apple than in a whole bottle of mineral supplements. You simply cannot get the minerals you need from a bottle or a drugstore. Only the diet can supply needed minerals. If a person is unwilling to adopt a healthy diet, then at least let him eat a small amount of "real" food each day. The body will work hard to make do with any minerals in their natural food form, no matter how small the amount.

Article #1: The Minerals Of Life By Dr. Herbert M. Shelton

It seems quite clear that the vital importance of the organic salts of foods was established by men who were outside the regular folds. The older physiologists and physiological chemists gave no attention to them. In the tables of food analysis they were regulated to the "ash" column and ignored.

At the present day their importance is everywhere recognized. It is no longer thought that only the "nutritive values"—proteins, carbohydrates, fats—are important.

Animals fed on foods deprived of their salts (minerals) soon die. In the same manner, they die if, to these demineralized foods, are added inorganic salts in the same quantities and proportions as are found in the ashes of milk. The salts must come to the body in the organic form. These inorganic salts are not used except in the presence of vitamins.

Berg has pointed out that there does not exist one single complete analysis, either of the human organism or its excretions or of our foodstuffs. Not everything is known about the function of minerals in the body and of some of them almost nothing is known. Some of them, such as zinc and nickel, apparently perform functions similar to those of vitamins. Prof. E. V. McCollum showed that animals deprived of manganese lose the maternal instinct, refuse to suckle their young, do not build a nest for them, and even eat their young. Their mammary glands do not develop properly and they are unable to secrete proper milk for their young. Here are effects commonly attributed to vitamin deficiency.

This "ash" enters into the composition of every fluid and tissue in the plant and animal body and without even one of these minerals, life could not go on. They are of the utmost importance. They serve a number of purposes. They form an essential part of every tissue in the body and predominate in the harder structures such as bones, teeth, hair, nails, etc. The bones consist largely of calcium phosphate.

They are the chief factors in maintaining the normal alkalinity of the blood as well as its normal specific gravity. They are also abundant in the body's secretions, and alack of them in the diet produces a lack of secretions. They are also used as detoxifying agents, by being combined with the acid waste from the cells. The wastes are thus neutralized and prepared for elimination. Their presence in the food eaten also aids in preventing it from decomposing. Acidosis produced by the fermentation of proteins and carbohydrates often comes because the mineral salts have been taken from the food, thus favoring fermentation.

In a simplified sense we may consider the blood and lymph as liquids in which solids are held in solution—much as salt is dissolved in water. The cells, which are bathed at all times in lymph, are also semi-fluid with dissolved matter in them. If the lymph outside the cells contains much dissolved solid, as compared to that within the cells, the cells shrink in size. If there is more dissolved solid within the cell than without, the cell expands and sometimes bursts. In either case the result is pathological.

If the amount of dissolved solids within and without the cell are equal, so that internal and external pressure are equalized, the cell remains normal. It falls very largely to the minerals of the food to maintain this state of osmotic equilibrium.

The waste formed in the body, due to its normal activities, is acid in reaction. The greater part of the work of neutralizing these acids is done by the mineral elements—the "ash."

These minerals enter into the composition of the secretions of the body. The hydrochloric acid in the gastric juice, for example, contains chlorine. Clotting of the blood does not take place without the aid of calcium or lime.

The mineral matters in food undergo no change in the process of digestion, prior to absorption, as do proteins, fats and carbohydrates. They are separated from these other elements in the process of digestion and pass directly into the blood.

If our foods do not contain enough of the right kinds of mineral salts we simply starve to death. It does not matter how much "good nourishing food," as this is commonly understood, that we consume, if these salts are not present in sufficient quantities we suffer from slow starvation, with glandular imbalance or disfunction, more disease and other evidences of decay. McCarrison showed, definitely, that foods and combinations of foods that are inadequate and unsatisfactory in feeding animals are equally as inadequate and unsatisfactory in feeding man.

Life and health are so directly related to these salts, of which little enough is known, that we can never have satisfactory health without an adequate supply of them. We may be sure that each salt has its own separate function to serve, while certain combinations of them have long been known to serve vital services in the body.

No drug salts can be made to take the place of those found in food. As Dr. William H. Hay, says: Nature provides all her chemicals for restoration of the body in the form of colloids, organic forms, and man has for a long time sought to imitate her in this, but he has not been so very successful that we are now able to insure the recouping of the mineral losses of the body by any artificial means, and must still depend on nature's colloids as found in plant and fruit." Well or sick, no compound of the chemist, druggist or "biochemist" can recoup your mineral losses.